

What is Claimed is:

1. A circuit interrupter apparatus for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, said circuit interrupter apparatus comprising:
 - 5 a microcontroller connected to said line monitoring device and to said line interrupter circuit, said microcontroller being programmable to receive and process inputs from said line monitoring device to determine the occurrence of a fault in said load, to operate said line interrupter circuit when said fault is detected.
 - 10 2. A circuit interrupter apparatus for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, said circuit interrupter apparatus comprising:
 - 15 a microcontroller connected to said line monitoring device and to said line interrupter circuit, said microcontroller being programmable to receive and process inputs from said line monitoring device to determine the occurrence of a fault in a load, and to operate said line interrupter circuit when said fault is detected; and
 - 20 a manual test device comprising a manual test switch connected to a driver circuit, said driver circuit being connected to said line monitoring device and being operable in response to activation of said manual test switch to induce a fault condition that is detected by said line monitoring device and indicated to said microcontroller by said inputs.
 - 25 3. A circuit interrupter apparatus as claimed in claim 1 or 2, wherein said load is connected to an AC power source and further comprising detector circuitry configured to open said load thereby generating a ground fault signal at a selected time which is substantially coincident with a zero-crossing of said AC power source, said ground fault signal being provided to said microcontroller to operate said line interrupter circuit and thereby remove power from said load, said microcontroller being programmable to directly monitor said line interrupter circuit, and then initiate said line interrupter circuit to restore power at a selected time relative to a zero-crossing of said AC power source.
 - 30 4. A circuit interrupter apparatus as claimed in claim 1 or 2, wherein a load is connected to an AC power source and further comprising detector circuitry configured to open said load thereby generating a ground fault signal at a selected time which is substantially coincident with a zero-crossing of said AC power source, said fault signal being provided to said microcontroller to operate said line interrupter circuit, said microcontroller's output comprising sufficient current to test said detector circuitry, but insufficient to activate said line interrupter circuit.
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5. A circuit interrupter apparatus as claimed in claim 1 or 2, for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, said interrupter apparatus comprising:

- 5 an indicator; and
a microcontroller connected to said line monitoring device, said line interrupter circuit and said indicator, said microcontroller being programmable to receive and process inputs from said line monitoring device to determine the occurrence of a fault, and to operate said line interrupter circuit when said fault is detected;
- 10 wherein said microcontroller is further programmable to operate said indicator to provide notification upon detection by said microcontroller of the occurrence of at least one of a plurality of conditions comprising: successful completion of a self- test, successful completion of a manual test, unsuccessful completion of said self-test, unsuccessful completion of said manual test, the need for a user to initiate said manual test, testing of said line interrupter to ensure proper function thereof, and testing power to said microcontroller to determine whether a reverse line load condition exists.

6. A circuit interrupter apparatus as claimed in claim 5, wherein said indicator comprises an LED.

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7. A circuit interrupter apparatus as claimed in claim 1 or 2, for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, said circuit interrupter apparatus comprising:
- 25 a microcontroller connected to said line monitoring device and to said line interrupter circuit, said microcontroller being programmable to receive and process inputs from said line monitoring device to determine the occurrence of said fault, and to operate said line interrupter circuit when said fault is detected; and
a reverse line load detector circuit coupled to said microcontroller to ensure that said microcontroller is receiving power.

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8. A circuit interrupter apparatus as claimed in claims 1 or 2, wherein:
said microcontroller is programmed to perform at least one self-test wherein said microcontroller operates said line interrupter circuit regardless of said inputs, said ground fault circuit interrupter apparatus conducting said at least one self-test by said microcontroller initiating said fault, said line monitoring device detecting said fault, and said line monitoring

device sending an input to said microcontroller wherein said microcontroller initiates said line interrupter circuit.

9. A circuit interrupter apparatus for detecting faults in an electrical load
5 connected to a line monitoring device and a line interrupter circuit, comprising:

a contact detector apparatus comprising a sensing circuit coupled to said line interrupter circuit, said sensing circuit having an input to said microcontroller, wherein said microcontroller is operable to detect whether a signal is present at said line interrupter circuit indicating that said line interrupter circuit is closed, or whether said signal is not present
10 indicating that said line interrupter circuit is open.

10. A circuit interrupter apparatus for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, the circuit interrupter apparatus comprising:

a microcontroller connected to said line monitoring device and to said line interrupter circuit, said microcontroller being programmable to receive and process inputs from said line monitoring device to determine the occurrence of a fault, and to operate said line interrupter circuit when said fault is detected; and

15 a manual test switch connected to an input port of said microcontroller, said microcontroller being programmed to operate said line interrupter circuit in response to
20 activation of said manual test switch.

11. A circuit interrupter apparatus for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, said circuit interrupter apparatus comprising:

a microcontroller connected to said line monitoring device and to said line interrupter circuit, said microcontroller being programmed to receive and process inputs from said line monitoring device to determine if said load is in open state due to an external condition not relating to the load, and to operate said line interrupter circuit in order to restore power to said when said open state is detected.
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- 30 12. A circuit interrupter apparatus as claimed in claim 11, wherein said external condition includes a shock or vibration.

13. A method for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, said method for detecting faults comprising:

35 initiating a fault signal from said microcontroller;

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detecting said fault signal at said line monitoring device;
sending an input signal to said microcontroller to initiate said line interrupter circuit;
and
sensing a signal from a contact detector circuit, said contact detector circuit having an
5 input to said microcontroller.

14. A method for detecting faults in a load connected to a line monitoring device and a line interrupter circuit, comprising operating a manual test device, said method for detecting faults further comprising:

10 initiating a signal via said manual test device connected to a driver circuit, said signal inducing a fault condition via said driver circuit;
sensing said fault condition by said line monitoring device;
indicating said fault condition to a microcontroller; and
sensing a signal from a contact detector circuit having an input to said
15 microcontroller.

15. A method for detecting faults in an electrical load connected to a line monitoring device and a line interrupter circuit, said method for detecting faults comprising:
receiving and processing input signals by a microcontroller in response to activation
20 of a manual test switch coupled to an input of said microcontroller;

initiating said line monitoring device to generate the occurrence of a fault in said electrical load; and
operating said line interrupter circuit when said fault is detected.

25 16. A method for maintaining power to an electrical load despite external conditions causing an open circuit state comprising:
receiving and processing inputs from a line monitoring device by a microcontroller;
determining if the load is in open state due to an external condition not relating to the
load; and
30 operating a line interrupter circuit in order to restore power to the load when said open circuit state is detected.